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**Johta et al.**

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(54) **STEERING DEVICE**

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(58) **Field of Classification Search**
CPC ..... B62D 1/187; B62D 1/184; B62D 1/195
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2001/0019205 A1 9/2001 Ikeda et al.
2007/0068311 A1 3/2007 Shimoda et al.
(Continued)

FOREIGN PATENT DOCUMENTS

JP 2002-120731 A 4/2002
JP 2002-160646 A 6/2002
(Continued)

OTHER PUBLICATIONS

International Search Report of PCT/JP2014/077731, dated Jan. 20, 2015. [PCT/ISA/210].

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(57) **ABSTRACT**

A steering device which slides when an impulse load is applied. The steering device includes an inner column having a cylindrical shape and a first hole opened therein, an outer column having a slit, an outer column bracket to tighten the outer column, an inner column bracket having a second hole opened therein, and a connection member provided at a position straddling the first hole and the second hole and detachably connecting the inner column and the inner column bracket. The telescopic friction plates are disposed at both sides of the outer column. The inner column bracket includes an arm portion connecting the telescopic friction plates disposed at both sides of the outer column, a neck portion projected from the arm portion, and a leg portion provided at an end opposite to the arm portion of the neck portion and contacting the inner column.

**6 Claims, 35 Drawing Sheets**